32. (amended) A system in accordance with Claim 31 further comprising a steam turbine and generator assembly, and a steam line, said steam line extending from said steam generator through said second regenerative heat exchanger to said steam turbine to direct a portion of an output of said steam generator through said second regenerative heat exchanger and to said steam turbine and generator assembly.

33. (amended) A system in accordance with Claim 25 further comprising a steam turbine and generator assembly, and a steam line, said steam line extending from said steam generator to said steam turbine to direct a portion of an output of said steam generator to said steam turbine and generator assembly to generate electricity.

Remarks

The Office Action dated February 3, 2003 has been carefully reviewed and the foregoing amendment has been made in consequence thereof.

Claims 1-35 are pending in this application. Claims 1-11 and 25-33 stand rejected. Claims 12-24 and 34-35 are withdrawn from consideration.

Submitted herewith is a Submission Of Marked Up Claims in accordance with 37 C.F.R. § 1.121(c)(1)(ii).

The rejection of Claims 6-11 and 28-30 under 35 U.S.C. § 112, second paragraph is respectfully traversed.

Claims 6-11 and 28-33 have been amended, and Applicants respectfully submit that Claims 6-11 and 28-33 are definite and particularly point out and distinctly claim the subject matter that Applicants regard as their invention.

For the reasons set forth above, Applicants respectfully request that the Section 112 rejection of Claims 6-11 and 28-30 be withdrawn.

The rejection of Claims 1-11 and 25-33 under 35 U.S.C. § 103(a) as being unpatentable over Koutz (US 4,576,783) in view of either one of Interrante et al. (US 3,821,358) or Wentorf (US 3,842,164) is respectfully traversed.

Koutz describes a system for increasing the temperature of a fluid heated by a high temperature gas cooled nuclear reactor. The system includes a high temperature gas cooled nuclear reactor and a secondary closed loop of a working fluid. The fluid in the closed loop is heated in an intermediate heat exchanger in communication with the reactor coolant. The system also includes a heat pump to heat the working fluid to about 1500°F. The working fluid is then passed through a hydrogen production generator where the working fluid transfers heat to the hydrogen production generator. The working fluid in the closed loop then passes through a turbine, which is part of the heat pump, which cools the working fluid to about 1080°F. The working fluid is then passed through a steam generator to heat feed water for the hydrogen production generator to about 900°F, and is then directed back to the intermediate heat exchanger.

Claim 1 of the present application recites a system for generating hydrogen that includes feed water, a liquid metal nuclear reactor having a non-radioactive secondary heat loop including a recirculated heat transfer medium, and a steam generator connected to the secondary heat loop. The heat transfer medium and the feed water pass through the steam generator. The steam generator is capable of raising the temperature of the feed water. The system also includes a high temperature water cracking system with the feed water coupled to the water cracking

system by a feed water input line, and a topping heater. The topping heater is capable of raising the temperature of the feed water, and the feed water input line is coupled in flow communication with the steam generator, the topping heater, and the high temperature water cracking system. The feed water is disassociated into hydrogen and oxygen in the high temperature water cracking system.

Claim 25 of the present application recites a system for generating hydrogen that includes feed water, a liquid metal nuclear reactor having a non-radioactive secondary heat loop including a recirculated heat transfer medium, and a steam generator connected to the secondary heat loop.. The steam generator is capable of raising the temperature of the feed water to between about 450°C to about 550°C. The system also includes a high temperature water cracking system with the feed water coupled to the water cracking system by a feed water input line, and a topping heater. The topping heater is capable of raising the temperature of the feed water so that the feed water in the high temperature water cracking system is at least about 850°C. The feed water input line is coupled in flow communication with the steam generator, the topping heater, and the high temperature water cracking system. The feed water is disassociated into hydrogen and oxygen in the high temperature water cracking system.

Applicants respectfully submit that Koutz does not describe nor suggest a system for generating hydrogen as recited in Claim 1 or a system as recited in Claim 25. Particularly, Koutz has a closed loop heating circuit 22 that includes a working fluid that is heated by the heat exchanger (steam generator) 20, passes through the heat pump (topping heater) 28 where it is heated further, passes through the hydrogen production generator 30 to provide heat to the hydrogen production generator, passes through a steam generator 38 to add heat to the feed

water, and then is circulated back to the heat exchanger (steam generator) 20. In contrast, the system recited in Claim 1 and the system recited in Claim 25 do not include a closed loop heating circuit that utilizes a working fluid. Rather, in the claimed systems, the feed water passes through the steam generator along with the heat transfer medium of the reactor secondary heat loop. In the Koutz system the feed water input line is not coupled to the steam generator connected to the reactor secondary heat loop, and the feed water does not pass through the heat exchanger connected to the reactor secondary heat loop. Also, the feed water input line is not coupled to the heat pump (topping heater).

Further, the Office Action at page 4, suggests that the steam generator of the present application "reads on heat exchanger 38" of Koutz. Applicants disagree with this suggestion because the heat transfer medium of the reactor loop 14 described in Koutz does not pass through heat exchanger 38. Both Claim 1 and Claim 25 recite that both the secondary loop heat transfer medium and the feed water pass through the heat exchanger. Accordingly, Applicants submit that Claims 1 and 25 are patentable over Koutz.

Interrante et al. and Wentdorf are cited for teaching the use of a liquid metal reactor as a heat source for thermochemical production of hydrogen and oxygen. Interrante et al. and Wentdorf are not cited for, and do not teach or suggest a high temperature water cracking system with the feed water coupled to the water cracking system by a feed water input line coupled in flow communication with the steam generator, the topping heater, and the high temperature water cracking system.

Koutz, Interrante et al. and Wentdorf, alone or in combination, do not describe nor suggest a system for generating hydrogen as recited in Claim 1 or a system as recited in Claim

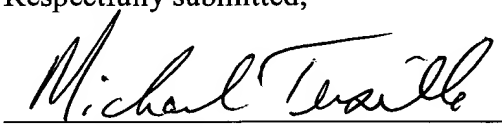
25. Particularly, and as explained above, Koutz, Interrante et al. and Wentdorf, alone or in combination, do not describe nor suggest a high temperature water cracking system with the feed water coupled to the water cracking system by a feed water input line coupled in flow communication with the steam generator, the topping heater, and the high temperature water cracking system, with both the feed water and the reactor secondary loop heat transfer medium passing through the steam generator. Accordingly Applicants submit that Claims 1 and 25 are patentable over Koutz, Interrante et al. and Wentdorf, alone or in combination.

Claims 2-11 depend from independent Claim 1 and Claims 26-33 depend from independent Claim 25. When the recitations of dependent Claims 2-11 and 26-33 are considered in combination with the recitations of Claims 1 and 25 respectively, Applicants respectfully submit that Claims 2-11 and 26-33 likewise patentable over Koutz, Interrante et al. and Wentdorf, alone or in combination.

For the reasons set forth above, Applicants respectfully request that the Section 103(a) rejection of Claims 1-11 and 25-33 be withdrawn.

In view of the foregoing amendments and remarks, all the claims now active in this application are believed to be in condition for allowance. Favorable action is respectfully solicited.

Respectfully submitted,



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24-BR-6010
PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Boardman et al.	:	
	:	Art Unit: 3641
Serial No.: 09/735,009	:	
	:	Examiner: R. Palabrica
Filed: December 12, 2000	:	
	:	
For: SYSTEM AND METHODS OF PRODUCING HYDROGEN USING A NUCLEAR REACTOR	:	

SUBMISSION OF MARKED UP CLAIMS

Commissioner for Patents
Washington, D.C. 20231

A marked-up version of amended Claims 1, 6-11, 25, and 28-33, in accordance with 37 C.F.R. § 1.121(c)(1)(ii), follows below.

MARKED UP CLAIMS

1. (thrice amended) A system for generating hydrogen comprising:

feed water;

a liquid metal nuclear reactor having a non-radioactive secondary heat loop comprising a recirculated heat transfer medium;

a steam generator connected to said secondary heat loop, said heat transfer medium and said feed water passing through said steam generator, said steam generator capable of raising the temperature of said feed water;

a high temperature water cracking system, said feed water coupled to said water cracking system by a feed water input line; and

a topping heater, said topping heater capable of raising the temperature of said feed water, said feed water input line coupled in flow communication with said steam generator, said

topping heater, and said high temperature water cracking system, said feed water disassociated into hydrogen and oxygen in said high temperature water cracking system.

6. (amended) A system in accordance with Claim 5 wherein a toping heater fuel comprises a portion of said oxygen and hydrogen [produced by] disassociated from said feed water in said high temperature water cracking system[is used as fuel in said topping heater].

7. (amended) A system in accordance with Claim 5 further comprising a first regenerative heat exchanger and a toping heater exhaust line, said exhaust line coupled to said first regenerative heat exchanger to direct[, and an] exhaust from said gas fired topping heater [is directed] into said first regenerative heat exchanger, said feed water input line coupled to said first regenerative heat exchanger downstream of said steam generator.

8. (amended) A system in accordance with Claim 7 further comprising a first regenerative heat exchanger exhaust line, said first regenerative heat exchanger exhaust line coupled to a desalination plant to direct [wherein said] exhaust from said gas fired topping heater [is directed] to [a] said desalination plant after passing through said first regenerative heat exchanger.

9. (amended) A system in accordance with Claim 7 further comprising a second regenerative heat exchanger and a first regenerative heat exchanger exhaust line, said first regenerative heat exchanger exhaust line coupled to said second regenerative heat exchanger to direct[, said] exhaust from said gas fired topping heater [is directed] to said second regenerative heat exchanger after passing through said first regenerative heat exchanger.

10. (amended) A system in accordance with Claim 9 further comprising a steam turbine and generator assembly, and a steam line, said steam line extending from said steam generator through said second regenerative heat exchanger to said steam turbine to direct [and] a portion of an output of said steam generator [is directed] through said second regenerative heat exchanger and to said steam turbine and generator assembly.

11. (amended) A system in accordance with Claim 1 further comprising a steam turbine and generator assembly, and a steam line, said steam line extending from said steam generator to said steam turbine to direct a portion of an output of said steam generator [is used] to [drive] said steam turbine and generator assembly to generate electricity.

25. (thrice amended) A system for generating hydrogen comprising:

feed water;

a liquid metal nuclear reactor having a non-radioactive secondary heat loop comprising a recirculated heat transfer medium;

a steam generator connected to said secondary heat loop, said heat transfer medium and said feed water passing through said steam generator, said steam generator capable of raising the temperature of said feed water to between about 450°C to about 550°C;

a high temperature water cracking system, said feed water coupled to said water cracking system by a feed water input line; and

a topping heater, said topping heater capable of raising the temperature of said feed water so that said feed water in said high temperature water cracking system is at least about 850°C, said feed water input line coupled in flow communication with said steam generator, said

topping heater, and said high temperature water cracking system, said feed water disassociated into hydrogen and oxygen in said high temperature water cracking system.

28. (amended) A system in accordance with Claim 27 wherein a toping heater fuel comprises a portion of said oxygen and hydrogen [produced by] disassociated from said feed water in said high temperature water cracking system[is used as fuel in said topping heater].

29. (amended) A system in accordance with Claim 27 further comprising a first regenerative heat exchanger and a toping heater exhaust line, said exhaust line coupled to said first regenerative heat exchanger to direct[, and an] exhaust from said gas fired topping heater [is directed] into said first regenerative heat exchanger, said feed water input line coupled to said first regenerative heat exchanger downstream of said steam generator.

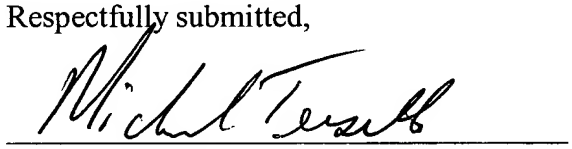
30. (amended) A system in accordance with Claim 29 further comprising a first regenerative heat exchanger exhaust line, said first regenerative heat exchanger exhaust line coupled to a desalination plant to direct [wherein said] exhaust from said gas fired topping heater [is directed to a] said desalination plant after passing through said first regenerative heat exchanger.

31. (amended) A system in accordance with Claim 29 further comprising a second regenerative heat exchanger and a first regenerative heat exchanger exhaust line, said first regenerative heat exchanger exhaust line coupled to said second regenerative heat exchanger to direct[, said] exhaust from said gas fired topping heater [is directed] to said second regenerative heat exchanger after passing through said first regenerative heat exchanger.

32. (amended) A system in accordance with Claim 31 further comprising a steam turbine and generator assembly, and a steam line, said steam line extending from said steam generator through said second regenerative heat exchanger to said steam turbine to direct [and] a portion of an output of said steam generator [is directed] through said second regenerative heat exchanger and to said steam turbine and generator assembly.

33. (amended) A system in accordance with Claim 25 further comprising a steam turbine and generator assembly, and a steam line, said steam line extending from said steam generator to said steam turbine to direct a portion of an output of said steam generator [is used] to [drive] said steam turbine and generator assembly to generate electricity.

Respectfully submitted,



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